

<b>Semester:</b>	03		
<b>Course Code:</b>	ZOOL 21722		
<b>Course Name:</b>	Developmental Biology and Human Genetics		
<b>Credit Value:</b>	02		
<b>Status:</b>	Compulsory		
<b>Pre-requisite:</b>	ZOOL 12703		
<b>Co-requisites:</b>	None		
<b>Hourly Breakdown:</b>	Theory	Practical	Independent Learning
	25	15	60

### Intended Learning Outcomes:

After completion of this course unit, the student will be able to:

1. explain the concepts and terminology in early animal development and human genetics,
2. explain the key cellular and molecular mechanisms underlying normal and abnormal animal development,
3. explain the properties and functions of stem cells,
4. discuss the developmental biology processes in animal development,
5. explain the importance and applications of genetics and genomics in human health and well-being,
6. identify the different developmental stages of animals using specimens, and
7. demonstrate basic skills in human pedigree and genetic analysis.

### Course Content:

**Developmental Biology:** Introduction to developmental biology: Ontogenic development, gametogenesis, fertilization, cleavage, gastrulation, formation of primary organ rudiments, organogenesis, growth and differentiation, metamorphosis leading to phenotypic transformations. Molecular mechanisms during different animal development: *Drosophila*, frog, chick and human; Axis formation, patterning, regulation of gene expression, cell polarity, cell signaling, growth factors, gradients, differentiation and cell-cell communication. Developmental processes during embryogenesis. Gastrulation and germ layers (endoderm, mesoderm and ectoderm) of selected model organisms. Cell migration, organogenesis, morphogenesis, neurogenesis, nerve cells, brain and spinal cord; Stem cells: terminology, properties, role during development and in adult animals, as model system for normal and abnormal development. Regeneration. Effects of individual gene variants on tissue function and on origin of abnormal development.

**Human Genetics:** Introduction to human genetics. Mechanisms of genetic variations. Patterns of human inheritance. The human genome and human genome project. Genes and diseases: monogenic, polygenic, multifactorial and epigenetic. Cancer genetics and the cancer genome atlas. Applications of human genetics and genomics; Genomic medicine: Genetic and Genomic testing; Identification of carriers and at-risk populations, prenatal and newborn screening; Molecular diagnostics and Genome editing; Advances, ethical and social implications of human genomic research.

Laboratory studies on early developmental stages of *Drosophila*, frog and chick, human karyotyping and pedigree analyses.

**Teaching /Learning Methods:**

A combination of lectures, practical sessions, computer-based learning, self-studies, assignments, small group discussions and group presentations.

**Assessment Strategy:**

Continuous assessment and end of semester examination. Percentage given for each sub-component indicates the percent contribution to the final marks.

Continuous Assessment 40 %		Final Assessment 60 %		
Details:		Theory	Practical	Other
Laboratory reports	10 %	60 %	-	-
Quizzes	10 %			
Assignments	10 %			
Group presentations	10 %			

**Recommended Readings**

1. Barresi, M. J. F. & S. Gilbert (2020). Developmental Biology, 12<sup>th</sup> Edition, Oxford University Press.
2. Korf, B. R. & M. B. Irons (2013). Human Genetics and Genomics, 4<sup>th</sup> Edition, Wiley-Blackwell
3. Human Genome Project Information Archive 1990-2003  
[https://web.ornl.gov/sci/techresources/Human\\_Genome/index.shtml](https://web.ornl.gov/sci/techresources/Human_Genome/index.shtml).